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		Date:	April 18, 2006
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Re:	Serial No: 09/721,884	**Pages:**	Cover + 19

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Henry Brendzel

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		Application Number	09/721,884
		Filing Date	11/24/2000
		First Named Inventor	Emden Gansner
		Examiner Name	Sathyanarayan Pannala
		Group/Art Unit	2671
Total number of pages in this Submission: this page, plus	18	Attorney Docket ID	Gansner 1999-0730

ENCLOSURES *(check all that apply)*

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Gansner 1999-0730

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Patent Application

Inventor(s)	Emden Gansner Eleftherios Koutsofios Stephen Charles North Russell N. Truscott	Case Name	Gansner 1999-0730
Filing Date	11/24/2000	Serial No.	09/721,884
Examiner	Sathyanarayan Pannala	Group Art Unit	2671
Title	System and Method for Large-Scale Data Visualization		

COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

SIR:

REMARKS

Responsive to a Notification of Non-Compliant Appeal Brief dated April 6, 2005, enclosed please find an amended brief.

Respectfully,
Emden Gansner
Eleftherios Koutsofios
Stephen Charles North
Russell N. Truscott

Dated: 4/18/06

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PATENT AND TRADEMARK OFFICE

Patent Application

Inventor(s)	Emden Gansner Eleftherios Koutsofios Stephen Charles North Russell N. Truscott	Case Name	Gansner 1999-0730
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SIR:

APPEAL BRIEF PURSUANT TO 37 CFR 1.191

(Amended)

(i) Real party in interest

The real parties in interest are AT&T Corp. the assignee of this application, and the inventors identified above.

(ii) Related appeals and interferences

There are no related appeals or interferences.

(iii) Status of claims

Claims 1-14 stand rejected.

- Claims 1-6, and 8-13 are rejected under 35 USC 103 as being unpatentable over Peters, US Patent 5,715,334, in view of Burfeind et al, US Patent 6.052,648.
- Claims 7 and 14 are rejected under 35 UCS 103 as being unpatentable over the Peters reference in view of the Burfeind et al reference and further in view of allegedly admitted prior art.

(iv) Status of amendments

An amendment after final was filed together with the Notice of Appeal on June 9, 2004 (received in the USPTO on 6/11/2004). No advisory action was received to indicate the status of the amendment, but a conversation with the Examiner revealed that (a) for reasons unknown to the Examiner, the filed amendment is not in the case, and (b) because an amendment to claim 1 was included (albeit a trivial one) the Examiner would not have entered the amendment.

(v) Summary of claimed subject matter

The following concise explanation of the subject matter define in each of the independent claims involved in the appeal is, necessarily other than the claim and, is not intended to define, or in any other way circumscribe the scope of the claims.

Independent claim 1:

Claim 1 defines a real-time large-scale visualization system. This system includes a visualization interface as depicted in FIG. 1 and described in the text associated therewith, and it includes a means for accessing a plurality of data files. Diagrammatically, this means is shown in FIG. 2 by the data collector module 201, and the specification teaches that data may be collected from different sources having their own specialized formats (page 6, line 109). The specification also teaches that such data must be converted to the internal self-describing format (page 6, line 110), and claim 1 specifies a plurality of processing tools. The specification also teaches (page 7, lines 128-129) about those processing tools for doing the format converting, and also about tools that do other processing, such as basic statistics (page 8, line 146). The claim further defines a means for accessing the data files, and that is depicted in FIG. 2 by element 202. Lastly, claim 1 defines a means that enables steaming, and that is represented by the interconnected modules of FIG. 3, which enable streaming by concurrently-operating processing pipelines.

Independent claim 8:

Claim 8 defines a method for visualizing large-scale data in real-time. The method includes a step of accessing data files that had been converted to a uniform self-describing format. The salient point of this step is that the data is in the form of a

self-describing format, and is uniform in that aspect. Impliedly, this data had not be in such a format but was converted to that format. This step is performed by the means for accessing, described above in connection with claim 1. Claim 8 also defines a step of streaming the data through one or more processing tools, and that is described by the elements of FIG. 3. Lastly, claim 8 specifies a step of displaying the data, and that is carried out by visualization interface element 203 of FIGS. 1 and 4. This visualization interface is also depicted in FIG. 1, and in FIGS. 6-9.

(vi) Grounds of rejection to be reviewed on appeal

The claims were rejected under 35 USC 103 as being unpatentable over Peters, US Patent 5,715,334, in view of Burfeind et al, US Patent 6.052,648. More particularly, the Examiner asserts that the Peters reference teaches the "visualization interface," the "plurality of processing tools," and the "means that enables streaming the data" that are specified in claim 1. The Examiner admits that the Peters reference does not teach the particular "means for accessing" that claim 1 specifies, but asserts that Burfeind does.

(vii) Argument

Group A: Claims 1, 2, 3, 7, 8, 9, 10, and 14

The Peters reference:

The Peters reference teaches an image information enhancement technique through "novel 'smoothing' and 'detail enhancement'" techniques for processing digital images." Col. 3, lines 14-16. The described method

> makes possible a separation of the image information into three objective distinct non-random intensity groups of 'large image feature' and small 'special detail' and 'intensity detail', and one group of random intensity information of the 'image noise'." Col. 3, lines 23-27.

The precise method by which the technique achieves its results is not pertinent to this appeal. Suffice it to say that the presented image is enhanced by operation of some processing modules that perform both smoothing and detail enhancement. Additionally, the reference teaches a new detail filter that

> produces images which characterize the intensity distributions with an image. It provides a tool for a novel method of image information

> analysis and classification based on the concept that any image communicates information only through image contrasts which are intensity variations between certain pixel arrays with in the total data matrix. Col. 6, lines 59-65.

In trying to classify the information that an image contains, Peters concludes that images in general can be divided into a non-random structural class of features and detail, and a random class of noise. Col. 14, line 64 – col. 15, line 2. Peters further concludes that a

> feature is an image component accessible to visual pattern recognition, i.e., it is larger than ~ 10% of the picture widths, and has a contrast range of more than ~5% of the visual intensity range, and each must fall within no more than 15-20 intensity levels in order to be recognized as a pattern. Col. 15, lines 2-8.

All other structural image components are summarized by Peters as "details," but he nevertheless subdivides this category as follows:

> small high contrast components (<10% PW, >5% BW) are characterized as spatial (sic) details, col. 15, lines 8-10

whereas

> low contrast components of any size (<5% BW) are characterized as intensity details. Col. 15, lines 10-11.

In addition, Peters teaches,

> digital images contain noise of various origins. Only the high frequency noise components at the level of a few pixels are visually perceivable as random intensity fluctuations. Other low frequency noise components, which have the character of intensity details, may be recognizable only after eliminating (averaging, smoothing) the high frequency components. Col. 15, lines 12-18.

The above is visually illustrated in FIG. 5, showing features, special details, intensity details, and noise. The upper left corner of this two dimensional depiction corresponds to maximum intensity and spatial dimension, and the lower right corner corresponds to minimum intensity and spatial dimension.

FIG. 6 is a tutorial that has three parts.

The top part of FIG. 6, titled "Image Information Analysis" depicts a process or, more accurately, images at different stages of a process. At the left edge, a hypothetical "original" image is shown, which is the incoming data of this illustrative tutorial. A horizontal dashed line across the image (slightly below the midpoint of the image) is

extended to what appears to be a window that shows (not unlike what an oscilloscope might show) the signal that corresponds to the image pixels along this dashed line. It shows a signal that has a large value for about the first half the time – corresponding to a primarily white portion of the image, followed by a low value for the remainder of the time – corresponding to the primarily dark portion of the image.

Slightly below and to the right of this window there is a second "oscilloscope window" that shows both the hysteresis range and the smoothed image. To the right of the second window there is a third "oscilloscope window" that shows the detail image, and slightly to the right and above the third window there is a fourth "oscilloscope window" that shown the signal that corresponds to the enhanced version of the signal originally obtained from the hypothetical image at the left of the FIG. Finally, to the right of the fourth window there is an image that is an enhanced version of the image presented at the extreme left.

The middle portion of FIG. 6, titled "Image Information Classes" depicts the four digital information *classes* that Peters decided to employ. The four images that are presented show what the hypothetical image (presented at the left of the FIG's top portion) would look like if only the specified information were depicted. Thus, the left-most image depicts only the **noise** components of the original image, the image to the right of the noise image depicts only **spatial detail** contained in the original image. To the right of the spatial detail image there is an image of the **intensity detail** components of the original image. Lastly, to the right of the intensity detail image, at the right most part of the middle portion of FIG. 6, there is an image of the **features** contained in the original image.

The bottom part of FIG. 6, titled "Quantitation of Information and Quality," is a pictorial representation of the data classes that are found in the image. Termed an "information cube," it shows pictorially (a two-dimensional image of a three-dimensional cube that circumscribes three-dimensional structures) the amount of data that belongs to classes "F" (features), "I" (intensity detail), "S" (spatial detail), and "N" (noise), in order when viewed from the bottom of the cube toward its top.

Discussion of assertions based on Peters - claim 1:

In rejection claim 1, the Examiner asserted that Peters teaches:

- a "visualization interface," which is a module, or a technique used in a module, is taught by Peters teaches in FIG. 5 and the associated text at col. 14, line 63 to col. 14, line 36,
- "a plurality of processing tools" is taught in FIG. 6, and the associated text at col. 18, line 59 to col. 19, line 1
- "means that enables streaming the data to and through one or more said processing tools to create data results for updating one or more objects, which one or more object may be displayed by the visualization interface" is taught at FIG. 23, and the associated text at col. 29, lines 22-65.

Applicants disagree, respectfully submitting that the Examiner is misreading the teachings in the cited FIGs. and passages.

As for the first assertion, as indicated above, FIG. 5 is a two dimensional depiction of the different classes of objects that Peters concluded are useful in classifying images. FIG. 5 neither describes nor suggests any tool, or processing module. It also does not describe or suggest a "visualization interface."

The Peters reference might have a visualization interface that is used to display an enhanced version of an applied image, and/or used to display the "information cube." However, one cannot infer it from FIG. 5 and the associated text cited by the Examiner. In other words, strictly speaking, the Examiner erred.

The same applies to the second assertion, where the Examiner's refers to FIG. 6, and the text at col. 8, line 59 to col. 19, lines 1. Applicants note that the quoted passage refers to a tool for creating the information cube, but that is not a plurality of tools. The reference to FIG. 23 refers to the same tool.

A significantly stronger case for patentability exists in connection with the third and fourth clauses of claim 1.

The fourth clause of claim 1 specifies

> means that enables streaming the data to and through one or more of said processing tools to create data results for updating one or more objects, which one or more objects may be displayed by the visualization interface. (emphasis supplied)

The highlight phrases specify central attributes of the defined means. However, in applicants' view, the Examiner failed to give proper consideration to the highlighted phrases and, consequently, erroneously asserted that Peters teaches such a means.

Almost without exception software tools operate on data that is stored in a specified memory location. When one tool operates on the data, no other tool is permitted access to that data. Sometimes, a system calls for a tool to operate on data, modify it, and make subsequent passes, modifying the data with each pass. A single pass through a data set and even multiple passes through a data set are not a **streaming** operation. In contradistinction, a streaming operation is one where as soon as an element of data is available as a result of operation by one tool, it is applied to another tool.

The first software embodiment of *streaming* known to applicants is the "pipe" command in the UNIX operating system (specified by the "|" character). This command is an example of a "means that enables streaming." For example, the UNIX command line

who | wc

streams the result of the "who" tool to the "wc" tool.

Recently, in the context of the Internet, the concept of *streaming* was broadened somewhat to include chunks of data rather that just an element of data (such as when downloading video, before the download of the entire video is completed, it begins to be displayed), and those chunks are temporarily stored.

The tools, or tools, of Peters are clearly not used in the streaming mode, and there is no "means that enables streaming." Indeed, since the notion of having separate passes through the data is mentioned a number of times in the Peters reference (i.e., col. 13, lines 26, 50, 57; col. 17, lines 60-65), effectively **proves** that no streaming takes place in the Peters reference. Consequently, Peters has need for a "means that enables streaming."

The Examiner points to FIG. 23, and the associated text at col. 29, lines 22-65. Applicants respectfully submit, however, that neither FIG. 23 nor the cited text describe or suggest streaming, and certainly not a "means that enables streaming." What FIG. 23 does depict is a plurality of "information cubes," and the cited text states:

> The definition in digital images of any origin and content through PAIP of defined contrast classes and the quantitation of these classes provides a unique and new tool for image quality quantitation. The four

> intensity information classes can be schematically represented in an information cube (FIG. 23) which depicts the relative significant intensity (z coordinate) over the image (x and y coordinates).

Respectfully, that does not demonstrate that any streaming takes place in Peters, or that a "means that enables streaming" exists, or is suggested. The cited text neither suggests streaming nor precludes. However, the passage at col. 29, lines 35-37 clearly characterizes what FIG. 23 depicts, by saying

> In FIG. 23 info-cubes are presented of some of the microscopy data sets depicted in FIGS. 8-20. (emphasis supplied)

Clearly, therefore, FIG. 23 shows "information cubes" of various images that result from different data. In other words, each cube is an example of a specific input image. Consequently, it is clear that the FIG. 23 images represent different data and do not represent, or suggest, streaming.

Actually, even if the FIG. 23 images were depicting different stages of a processing chain responsive to a single set of data, it would still not prove the existence of streaming, since it can be simply a representation of the different stages that result (at different times) from different passes through the entirety of the data set.

In addition, the fourth clause of claim 1 specifies that the data is created by passing data through a plurality of tools, in a streaming manner, with the aid of a "means for enabling streaming" to update one or more objects adapted for display by the visualization interface. That is, the means for enabling streaming, and the tools, work to update objects that have been created previously, for example, from previous data, whether by streaming or otherwise. This in contrast to tools that create, or recreate objects *ab initio*. The Peters reference teaches, or suggests nothing relating to **updating** (existing) objects to be displayed. Actually, the clear thrust of the Peters teachings is that data which represents an image is provided, the data is processed, the processed data can be displayed as an enhanced image, and an "information cube" is created that can also be displayed. In short, no updating of existing objects.

Moreover, and linked to the fourth clause of claim 1, it should be noted that the notion of streaming is always associated with real-time systems. That is, real-time systems are systems that (1) receive data on a continuous basis, (2) immediately handle the data, and (3) dispose of it. Claim 1 indeed specifies that the defined system is a real-

time system, and this specification in the preamble is a limitation of the claim by virtue of the definition of the means that enables streaming. In contra distinction, there is no indication anywhere in the reference that the Peters system is a real-time system, and the Examiner has not pointed to any.

It bears reiterating that in the Peters environment, there is no need for streaming of data through tools (which, as indicated above, Peters neither describes nor suggests) and there is no need for updating of rendered objects (which Peters neither describes nor suggests) because there in additional data that is incoming that might affect the rendered object. It is not surprising therefore that Peters neither describes nor suggests such features. Moreover, there is no motivation for incorporating such features into the Peters arrangement.

For these reasons, it is clear that the Examiner erred in his asserting a correspondence between the teachings of Peters and the fourth clause of claim 1.

The Burfeind reference:

The Examiner admits that Peters has nothing to correspond to the third clause of claim 1, but asserts that Burfeind does. Specifically, the Examiner asserts that in FIGS. 5 and 6, and in the associated text at col. 5, lines 2-13, Burfeind teaches a "means for accessing a plurality of data files that had been converted to a uniform self-describing format." Applicants respectfully disagree and, frankly, applicants are at a loss.

The Burfeind FIG. 5 "is an exemplary representation of a virtual set according to one embodiment of the invention." Col. 2, lines 5-6. In col. 3, lines 27-29, the reference is more specific; saying that "[A]s shown in FIG. 5, weather forecaster 34 is the subject, and is shown in room or portion thereof 36."

The Burfeind FIG. 6 shows just the outline of the room and the outline of the weather forecaster.

It is hard to understand how the Examiner points to FIG 5 and 6, which depict different images, and asserts that they are "means." While one must surmise that these images come from stored files, it remains hard to understand how such images describe ANY format, even if the images are stored in some files. Compounding the puzzle, it is hard to understand how such images describe the format of files, how such images

describe or suggest files that have a self-describing format, or how such images describe or suggest files that have a uniform self-describing format.

The text cited by the Examiner refers to FIG. 9, and not to FIGS. 5 and 6, but a perusal of the text that does related to FIGS. 5 and 6 neither describes nor suggest any format for any files.

As for FIG. 9, it depicts a system. The aforementioned cited text states:

> Referring back to FIG. 9, after a virtual set has been generated by video camera 44, and a chroma-key mask has been generated by chroma-key device 58, both of these signals are fed into the real-time texture map device 60. The mask output of device 58 is input as the alpha input (shown in FIG. 6), and the video feed output of camera 44 is input as the video input (shown in FIG. 5). Texture map device 60 converts those parts of the video feed that correspond to the on color of the alpha input to a texture memory, which is a digital representation of the weather forecaster stored in the memory of the computer in a format having the ability to be manipulated by the graphics processors of the computer.

To the Examiner's credit, the one and only occurrence in the entire Burfeind patent of the word "format" is found in the above quoted patent, which teaches that a digital representation of the weather forecaster is stored in memory of the computer in a format having the ability to be manipulated by the graphics processor of the computer. This teaching, however, does **not** support the Examiner's assertion, because it teaches essentially nothing about the format of the file that stores the digital representation of the weather forecaster. Aside from the essentially non-existent limitation that the format of the file must be such that another program can manipulate the file, anything goes. As long as the graphics processors of the computer can manipulate the information, the requirements of the Burfeind teachings are satisfied. This is valid whether a file is of a self-describing format, or not.

At best, one might say that the Burfeind reference, as a whole, depict a system that employs files to create a composite image. The associated text cited by the Examiner supports such a characterization but, as indicated in the response to the previous Office Action, and as explained above, the notion of employing files to create a composite image neither teaches nor suggests that the files are ones that have a "self describing format." It is noted that, moreover, the notion employing files to create a composite image does not teach or suggest a "**uniform** self-describing format" (emphasis supplied),

and it also does not teach or suggest that such files were converted to such a format from some other format.

Based on the above, it is respectfully submitted that the Examiner erred in asserting that Burfeind teaches a "means for accessing a plurality of data files that had been converted to a uniform self-describing format."

Additionally, there is nothing in the Peters reference that suggests the notion of self-describing format of files. Such a format will not improve the operation of the Peters arrangement at all, because the data that comes is of a known variety, and the tools are adapted to work with that data. There is no need for identifying the format of the data. Hence, there is absolutely no motivation for modifying the Peters arrangement in thhe manner suggested by the Examiner (even if the Burfeind reference were teaching what the Examiner asserts).

In short, it is respectfully submitted that a careful reading of the Peters and Burfeind references reveals that the claim 1 limitations define subject matter that is not obvious in view of the Peters and Burfeind combination of references. The Examiner erred in not taking proper cognizance of the limitations found in claim 1, which make claim 1 clearly patentable.

Discussion – claim 8:

Independent claim 8 is a method claim that includes the above-discussed limitations of

(1) being a *real-time* method;

(2) data files have a *self-describing format*;

(3) data files have a *uniform* self-describing format;

(4) *streaming* of data; and

(4) streaming of data to create results for *updating* one or more objects.

In light of the above limitations, for the reasons expressed above in connection with claim 1, it is respectfully submitted that the Examiner erred in not taking proper cognizance of the limitations found in claim 8, which make claim 8 clearly patentable.

Group B: Claims 4, and 11

Claim 4 specifies that the visualization interface "can access the data results as the processing tools are working on the data." This is different from prior art

systems, where a tool that operates on the data of a file does not make any data available until the module finishes the processing.

In rejecting the claims, the Examiner cited FIG. 6 and the text at col. 18, line 59 to col. 19, line 1. Applicants respectfully disagree that either FIG. 6 or the cited text suggests this capability. The substance of FIG. 6 was discussed in detail above, and in the interest of brevity it is not repeated here. With reference to the limitation discussed herein, it may be summarized that FIG. 6 shows image information analysis results, but there is nothing in the FIG. or in any associated text pertaining to any timing relative to processing, or relative to when processing results data is made available.

As for the specifically cited passage, it states:

> The data reduction to individual intensity information classes provides a new and unique tool for the analysis of image information and quantitation of the image information content and image quality. The application of this tool in digital image processing lead to the discovery that all known contrast mechanisms of any technical imaging equipment (microscopes, telescopes, photographic and video cameras, medical imaging technologies, etc.) establish one of the three basic intensity variations found as structural classes in digital images

Clearly, the above-quoted passage does not speak of any timing relative to processing, or relative to when processing results data is made available.

It is respectfully submitted that the references cited by the Examiner do not describe or suggest a "visualization interface can access the data results as the processing tools are working on the data," and the Examiner erred in asserting that the Peters reference teaches the limitations of claims 4 and 11.

Group C: Claims 5, and 12

Claims 5 specifies that the visualization interface enables selection of a portion of the data results such that data corresponding to the selected portion may be accessed and processed, in real-time, to create second data results that are displayed on the visualization interface.

In rejecting claim 5, the Examiner asserted that the passage in the col. 6, line 59 to col. 7, line 6, of the Peters reference teaches this limitation. Applicants respectfully disagree. The cited passage states:

> The new detail filter produces detail images which characterize the intensity distributions within an image. It provides a tool for a novel

> method of image information analysis and classification based on the concept that any image communicates information only through image contrasts which are intensity variations between certain pixel arrays within the total data matrix. An area of certain contrast is defined by the differences between its average intensity and the surrounding intensity irrespectively of the overall intensity variations (background).

The passage teaches that an image has intensity variations, which produce contrast, but it neither teaches nor suggests the notion of (1) selecting a portion of the data results, (2) accessed in real time, (3) creating a second data result therefrom, and (4) displaying the second data results separately.

In short, it is respectfully submitted that the Examiner erred in making an assertion that is not supported by the passage cited by the Examiner and, indeed is not supported by any other passage in the cited references.

Group D: Claims 6, and 13

Claim 6 specifies that the processing tools enable creation of new processing expressions that are compiled and dynamically linked to the processing tools. Applicants believe that this is a quite unexpected and significant innovation.

In rejecting the claim, the Examiner asserted the Peters teaches this limitation in FIG. 6 and in the associated text at col. 18, line 59 to col. 19, line 5. Applicants respectfully disagree.

As to the content of FIG. 6, the reader's attention is respectfully to the discussion above. In applicants' view, FIG. 6 clearly does NOT describe or suggests **creating** processing expressions, and certainly not creating **new** processing expressions. Furthermore, FIG. 6 neither describes no suggests new processing expressions that are compiled and dynamically linked to the processing tools. As for the text cited by the Examiner, it addresses the fact that the Peters' invention discloses individual intensity information classes and that this approach to analysis of images lead "to the discovery that all known contrast mechanisms of any technical imaging equipment ... establishes one of the three basic intensity variations found as structural class in digital images." None of this (the FIG., the text, and/or their combination) teaches, or suggests, the notion of creating new processing expressing, or even allowing the creation of new processing expressions. Therefore, it is respectfully submitted that claim 6 is not obvious in view of

the cited references, taken singly or in combination, and that the Examiner erred in his assertions.

In light of the above arguments, it is respectfully requested that the Board return the case to the Examiner with directive to rescind the rejections and to allow all claims.

Respectfully,
Emden Gansner
Eleftherios Koutsofios
Stephen Charles North
Russell N. Truscott

Dated: 4/18/06

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(viii) Claims Appendix

1. A real-time large-scale visualization system comprising:

a visualization interface;

a plurality of processing tools;

means for accessing a plurality of data files that had been converted to a uniform self-describing format; and

means that enables streaming the data to and through one or more of said processing tools to create data results for updating one or more objects, which one or more objects may be displayed by the visualization interface.

2. The invention of claim 1 wherein the visualization interface provides linked views of the data results.

3. The invention of claim 2 wherein the visualization interface is capable of presenting a statistical two-dimensional view, a pixel-oriented two-dimensional view, and a dynamic three-dimensional detailed view.

4. The invention of claim 1 wherein the visualization interface can access the data results as the processing tools are working on the data.

5. The invention of claim 1 wherein the visualization interface enables selection of a portion of the data results such that data corresponding to the portion selected may be accessed and processed in real-time to create second data results that are displayed on the visualization interface.

6. The invention of claim 1 wherein the processing tools enables creation of new processing expressions that are compiled and dynamically linked to the processing tools.

7. The invention of claim 1 wherein the data is accessed using Direct IO.

8. A method of visualizing large-scale data in real-time comprising:

accessing a plurality of data files that had been converted to a uniform self-describing format;

streaming the data to and through one or more processing tools to create data results for updating one or more objects, which one or more objects are adapted for display;

displaying said one or more objects on a visualization interface.

9. The invention of claim 1 wherein the visualization interface provides linked views of the data results.

10. The invention of claim 2 wherein the visualization interface is capable of presenting a statistical two-dimensional view, a pixel-oriented two-dimensional view, and a dynamic three-dimensional detailed view.

11. The invention of claim 1 wherein the visualization interface can access the data results as the processing tools are working on the data.

12. The invention of claim 1 wherein the visualization interface enables selection of a portion of the data results such that data corresponding to the portion selected may be accessed and processed in real-time to create second data results that are displayed on the visualization interface.

13. The invention of claim 1 wherein the processing tools enables creation of new processing expressions that are compiled and dynamically linked to the processing tools.

14. The invention of claim 1 wherein the data is accessed using Direct IO.

(ix) Evidence appendix

No evidence is offered.

(x) Related Proceedings appendix

There are no related proceedings.